

PENT COOPERATION TRE
PCT
INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Rec'd PCT/REC 0071 SEP 2004

WIPO

PCT

10/506783

Applicant's or agent's file reference RS/nj-15250	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/CH 02/00148	International filing date (day/month/year) 12.03.2002	Priority date (day/month/year) 12.03.2002
International Patent Classification (IPC) or both national classification and IPC H04Q7/38		
Applicant ASCOM AG et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.
 - This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:
 - I Basis of the opinion
 - II Priority
 - III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV Lack of unity of invention
 - V Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI Certain documents cited
 - VII Certain defects in the international application
 - VIII Certain observations on the international application

Date of submission of the demand 26.09.2003	Date of completion of this report 30.06.2004
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Delucchi, C Telephone No. +49 89 2399-7305



INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

International application No. PCT/CH 02/00148

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-8, 10-12 as originally filed
9 received on 15.05.2004 with letter of 13.05.2004

Claims, Numbers

1-12 received on 15.05.2004 with letter of 13.05.2004

Drawings, Sheets

1/2-2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:
- the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/CH 02/00148

5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).
(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-12
	No: Claims	
Inventive step (IS)	Yes: Claims	1-12
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/CH02/00148

Concerning Item I

Basis of the opinion

1. This preliminary examination report is based on **claims 1-12** filed with letter of 13.05.2004 which have been found to fulfil the requirements of Article 34(2)(b) PCT.
2. Reference is made to the following documents:
D1: EP-A-0 933 955 (TOKYO SHIBAURA ELECTRIC CO) 4 August 1999
D2: US 2001/019954 A1 (SEOL MYOUNG-KI ET AL) 6 September 2001

Concerning Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Having regard to the documents cited in the International Search Report the subject-matter of **claims 1-12** appears to meet the requirements of Article 33(1) PCT in respect of **novelty, inventive step and industrial applicability**.
- 1.1 The closest prior art is found to be document **D1**, which discloses a mobile radio network based on CDMA. The base stations are combined in groups of base stations, where each group of base stations is allocated a plurality of transmissions frequencies, each transmission frequency including a plurality of CDMA transmission channels. In order to average the occupancies of these frequency channels, the channel occupancy of a plurality of frequency channels is monitored using corresponding monitoring means. That is, it is determined how many user connections are established sharing the same transmission frequency.

The network of **D1**, however, does not have the possibility to determine whether a user actually transmits data in an established user connection or not, since the *channel occupancy* of **D1** merely shows how many users occupy a certain channel.

Therefore, departing from **D1**, the problem to be solved by the claimed invention could be formulated as *how to provide the monitoring of an individual user to*

determine whether he exploits the whole transmission capacity that has been assigned to him before or not.

The invention according to **claim 1** defines a **method for allocating radio resources of a radio communication network** to a plurality of users, where a user is allocated a certain transmission capacity, characterized in that a *utilization factor* relating to said transmission capacity is determined and the radio resources are allocated depending on said *utilization factor*, where determining said *utilization factor* includes determining *how much of said transmission capacity is actually used by said user*.

Since **D1** does not disclose the feature of an *utilization factor* being determined as defined above, the subject-matter of **claim 1** is **novel** over the available prior art as required by Article 33(2) PCT.

The **advantage** of the solution proposed in the present application, is that upcoming allocations of resources can be decided on the basis of the actually usage of already assigned resources, i.e. on the behaviour of the network users, this involving a more efficient resource management and enhancement of data throughput in the network.

Neither **D1** nor the remaining prior art discloses or suggests the determination of an *utilization factor* that includes determining *how much of said transmission capacity allocated to the user is actually used by said user*.

Moreover, the method as defined in **claim 1** is considered to define, for a person skilled in the art, an inventive solution to the above formulated problem, since the described novel method steps are non-obvious when departing from the available prior art and common knowledge in this technical field.

As a consequence, the subject-matter of **claim 1** is considered **inventive** as required by Article 33(3) PCT.

- 1.2 The same reasoning as for **claim 1** also applies to **independent claims 8 and 12**, which respectively defines a **radio communication network** and a **device** for carrying out the **method** according to **claim 1**.

As a consequence, the subject-matter of both **claims 8 and 12** is also considered **novel and inventive** as required by Article 33(2),(3) PCT.

- 1.3 **Claims 2-7 and 9-11** are dependent on **claims 1 and 8** and as such also meet the requirements of the PCT with respect to **novelty and inventive step** (Article 33(2),(3) PCT).
- 1.4 The invention as defined by **claims 1-12** is obviously industrially applicable (Article 33(4) PCT).
2. Notwithstanding the positive opinion on the **novelty, inventive step and industrial applicability** of the present **claims 1-12**, the application does not meet the requirements of Article 6 PCT, because **claims 1, 8 and 12** are not clear.

It is clear from the description, that the main idea of the invention is to monitor whether an individual user actually exploits the whole transmission capacity that has been assigned to him *before* and to amend the allocation practice for *upcoming* allocations depending on the determined exploitation rate in order to enhance the exploitation of the transmission capacity of a mobile radio network. If for example a user requests and is assigned a transmission capacity of 100 kB/s and it is found that the user actually uses only 50 kB/s to transmit his data, the utilization factor is for example determined to be 50%. The next time this user requests a transmission capacity of 100 kB/s he will be assigned for example a transmission capacity of only 70%.

It is considered, however, that the wording of **claims 1, 8 and 12** does not clearly reflect the fact that the *utilization factor*, that includes *determining how much of the already at the moment allocated transmission capacity to a certain user is actually used by said user*, is then used by the method to decide about a *certain transmission capacity for an upcoming allocation to the said user*.

3. Furthermore, the applicant's attention is drawn to the fact that, according to the requirements of Rule 5.1(a)(ii) PCT, the **relevant background art** disclosed in the cited prior art documents should have been mentioned in the description.

replacement sheet 9

ted a specific radio resource only for small periods of time, no matter whether the user has a small or a large amount of data to send.

In our example in figure 2, the user has a lot of data to send, which is indicated by row 2.1, which is high almost all of the time. As shown by the alternating row 2.2, the user is allocated a specific radio resource only for small periods of time. Later on, when the resource allocation algorithm of the radio network realises that the user has a large amount of data to send, the user is allocated the resource a long period of time. In this case, row 2.3 which shows the actual transmission time, has substantially the same shape as row 2.2, which indicates that the actual sending time is not limited by the ability of the user to produce the data but by the short resource allocation periods. Accordingly, the data throughput is lowered, because the user has to wait for data transmission almost all of the time, when he is not allocated any resources. This is shown in row 2.4. The last row 2.5 again shows the wastage of the radio resources. Here the advantage of this allocation method can be seen. Only a small amount of the allocated radio resources are wasted, because the periods of time, where the user is allocated the radio resources, but does not actually transmit any data, are very small. Hence the available radio resources can be shared with other users.

To find a better radio resource allocation algorithm, for instance an algorithm allowing to find a compromise between data throughput and resource wastage, it is essential to know, how much of the radio resources allocated to a particular user are actually utilized by the user to transmit data.

According to the invention, a utilization factor, which is a measure for the amount of radio resources wasted by a user, is determined. As an example of a radio communication network, figure 3 shows a part of a mobile telephone network with a mobile switching centre (MSC) 3, two basestations 4 and 5, which are connected to the MSC 3 by communication links 6 and 7, and two mobile user terminals 8 and 9, which are connected to the basestations 4 and 5 respectively by radio links 10 and 11.

Claims

1. Method for allocating radio resources of a radio communication network to a plurality of users (8, 9), where a user is allocated a certain transmission capacity, characterised in that a utilization factor relating to said transmission capacity is determined and the radio resources are allocated depending on said utilization factor where determining said utilization factor includes determining how much of said transmission capacity is actually used by said user.
5
2. Method according to claim 1, characterised in that said utilization factor is determined by detecting (18) time intervals in which the user does not exploit the transmission capacity allocated to him.
10
3. Method according to claim 2, characterised in that those time intervals are detected (18), in which the user does not transmit or receive any data.
4. Method according to claim 3, characterised in that said time intervals are detected by directly monitoring (16.4) a radio interface (10) of the radio communication network
15 and detecting time periods without any data throughput.
5. Method according to claim 3, characterised in that a multilayer protocol stack with a first layer is used to transmit data between a transmitter (8) and a receiver (9) and said time intervals are detected by monitoring (16.5) said first layer directly in the transmitter and/or the receiver.
20
6. Method according to claim 3, characterised in that, the user is allocated radio resources by allocating a data transmission rate and said time intervals are detected by subtracting a target transmission time for transmitting a certain amount of data with said data transmission rate from an actual transmission time required by the user to trans-

replacement sheet 14

mit said amount of data, where the actual transmission time is measured and the target transmission time is calculated by dividing said amount of data by said data transmission rate.

7. Method according to one of claims 1 to 6, characterised in that the transmission capacity allocated to the user comprises several transmission channels and the utilization factor is determined separately for each transmission channel.
8. Radio communication network with means (21) adapted to allocate radio resources to a plurality of users (8, 9), where a user is allocated a certain transmission capacity, characterised in that the radio network includes means (18, 19) adapted to determine a utilization factor relating to said transmission capacity and in that the means (21) adapted to allocate radio resources are adapted to allocate the radio resources depending on said utilization factor where the means (18, 19) adapted to determine said utilization factor include means adapted to determine how much of said transmission capacity is actually used by said user.
9. Radio communication network according to claim 8, characterised in that the means (18, 19) adapted to determine the utilization factor are adapted to detect time intervals, in which the user (8, 9) does not exploit the transmission capacity allocated to him.
10. Radio communication network according to claim 8 or 9, characterised in that the means (18, 19) adapted to determine the utilization factor are adapted to detect time intervals, in which the user does not transmit or receive any data.
11. Radio communication network according to one of claims 8 to 10, where the transmission capacity can be allocated to a user (8, 9) by allocating several transmission channels to the user, characterised in that the means (18, 19) adapted to determine

replacement sheet 15

the utilization factor are adapted to determine the utilization factor separately for each transmission channel.

12. Device (16.1, 16.2, 16.3, 16.4, 16.5) for a radio communication network as claimed in one of claims 8 to 11 with means (21) adapted to allocate radio resources to a plurality of users (8, 9), where a user is allocated a certain transmission capacity, characterised in that the device includes means (18, 19) adapted to determine a utilization factor relating to said transmission capacity where the means (18, 19) adapted to determine said utilization factor include means adapted to determine how much of said transmission capacity is actually used by said user.